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GB 1486299
GB 1474114
GB 1335846
GB 1444144
GB 1281425
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US 3956740A
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(54) **Terminal device**

(57) A portable self-contained hand-held terminal device (XATR) for Financial Transactions is adapted for use with one or more data storage and transfer cards (DSTCs) and other external devices, such as point of sale terminals. The transaction device includes a keyboard (211) for entering transaction data and control information, a store (251) for temporarily storing transaction data, and logic (251) for performing arithmetic, logical, and control operations. The logic includes a store for storing predetermined programs which are activated by instructions entered by means of the keyboard (211). Also included are a display (213) for selectively displaying transaction data and means (262, 264) for transferring selected data from the transaction device into suitable storage means located in the external device and into at least one DSTC. Account balance data in one DSTC may be credited while account balance data in another DSTC is debited as a result of the transaction.

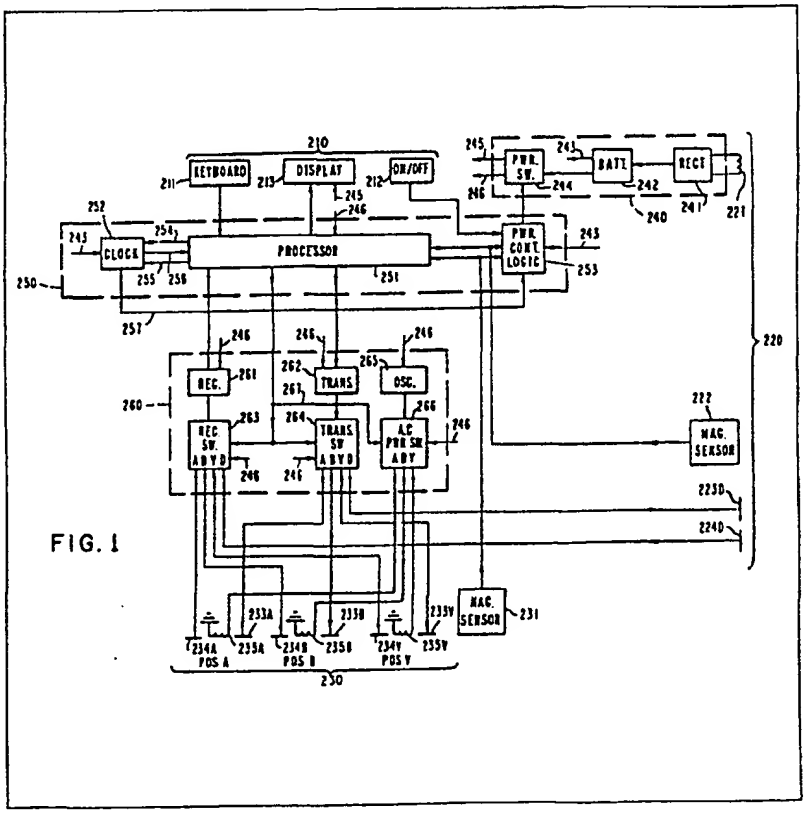

FIG. 1

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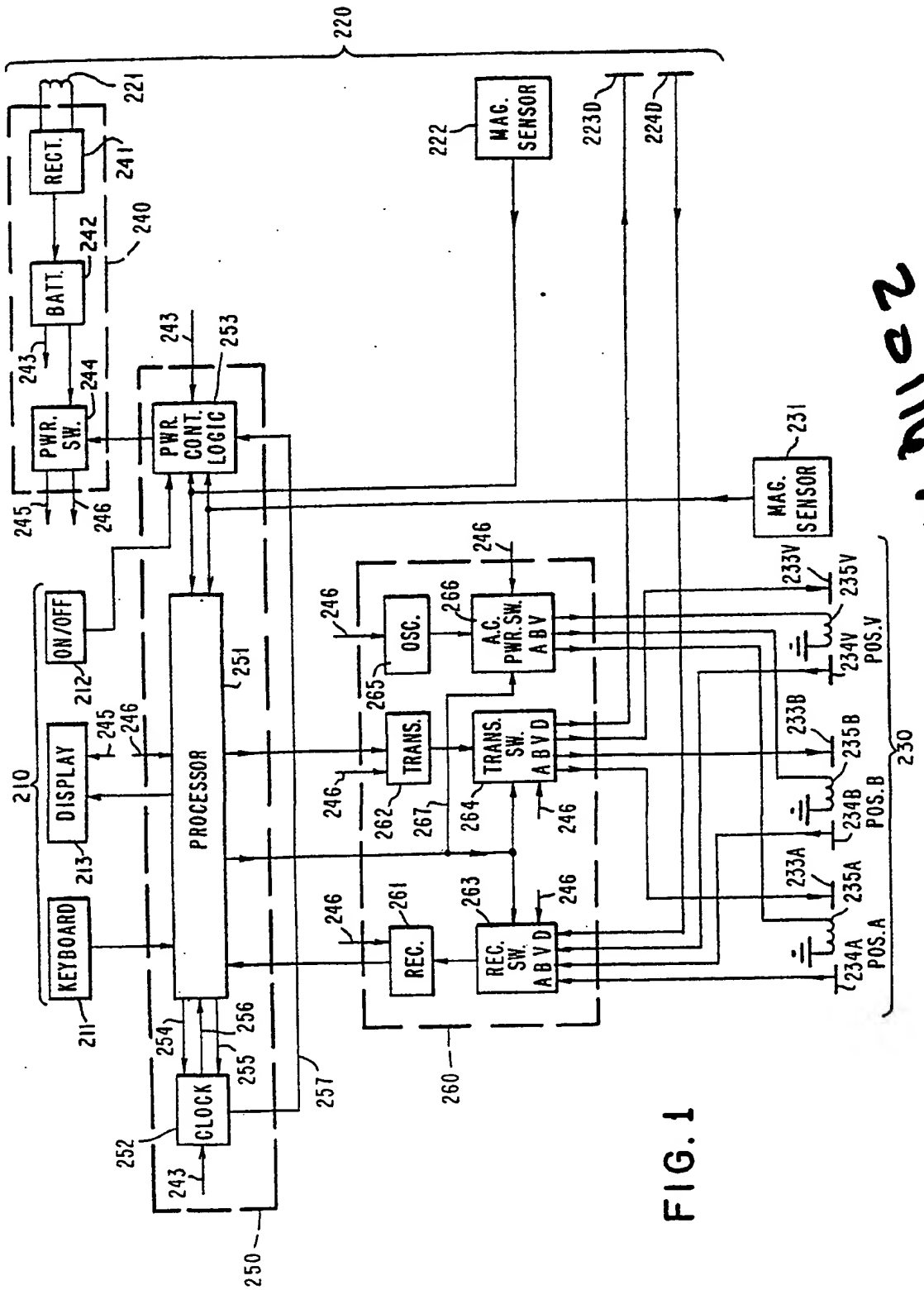

220
221
RECT.
241
240
BATT.
242
243
PWR. SW.
244
245
246
243
253
PWR. CONT. LOGIC
222
MAG. SENSOR
223D
224D
231
MAG. SENSOR
ON/OFF
212
210
DISPLAY
213
KEYBOARD
211
PROCESSOR
251
254
256
255
257
CLOCK
252
243
250
246
OSC.
266
265
A.C. PWR.SW. A B V
TRANS.
262
267
TRANS. SW. A B V D
264
REC.
261
263
REC. SW. A B V D
260
233V
235V
234V
POS.V
233B
235B
234B
POS.B
233A
235A
234A
POS.A
230

FIG. 1

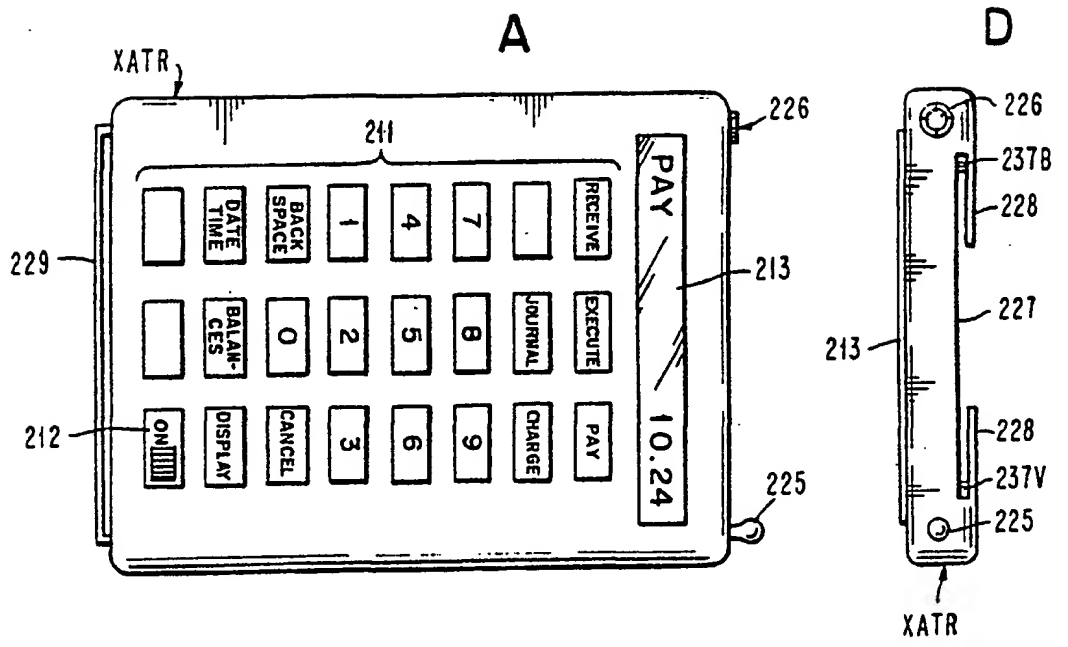

A
D
B
C
XATR
211
226
229
213
225
212
227
228
237B
237V
239
4
DATE TIME
BACK SPACE
RECEIVE
BALANCES
JOURNAL
EXECUTE
ON
DISPLAY
CANCEL
CHARGE
PAY
10.24
DATA STORAGE AND TRANSFER CARD
DSTC

FIG. 2

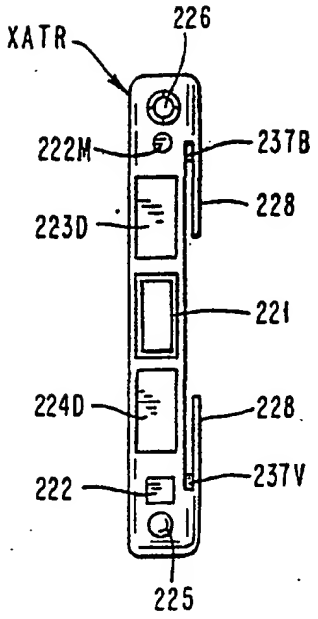

XATR
226
222M
237B
223D
228
221
224D
228
222
237V
225

FIG. 3

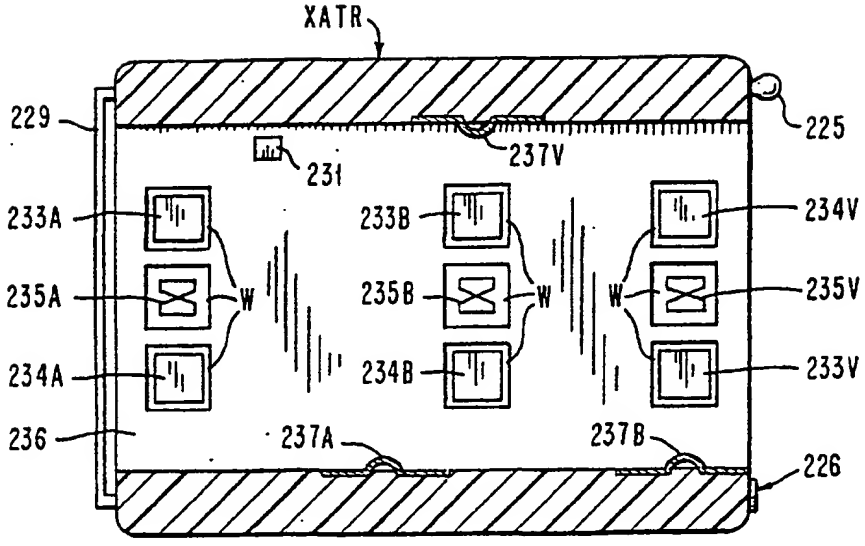
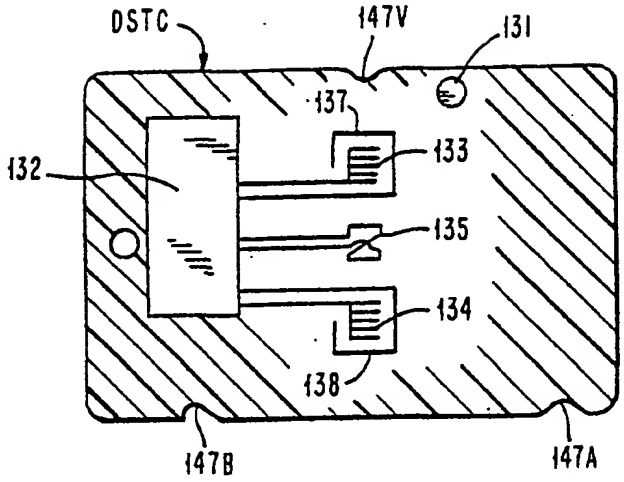

XATR
229
225
231
237V
233A
233B
234V
235A
W
235B
W
W
235V
234A
234B
233V
236
237A
237B
226

FIG. 4

FIG. 5



IL91C2

FIG. 6

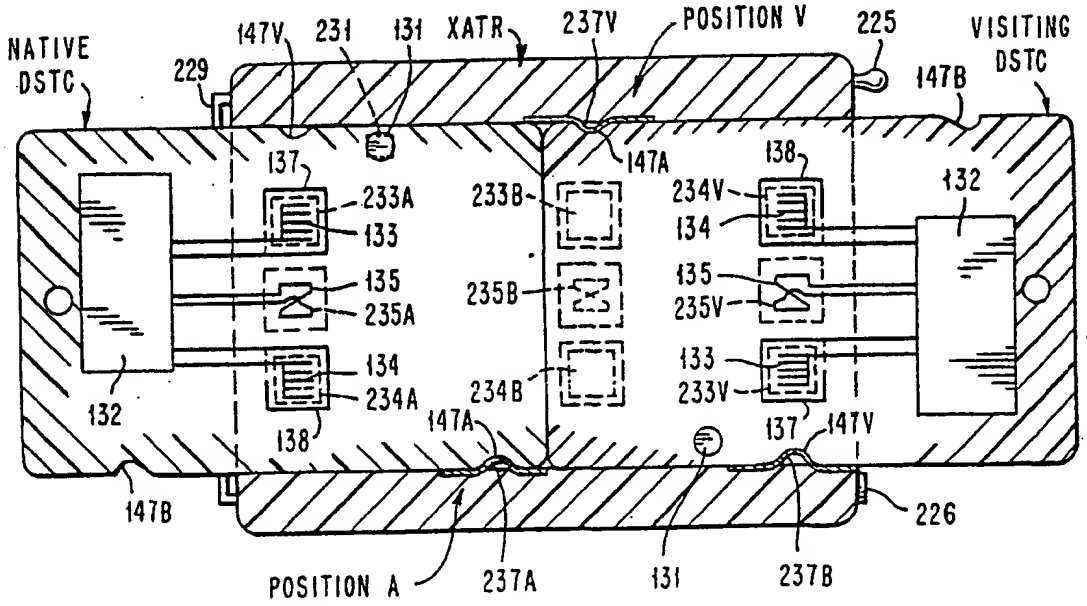


FIG. 7

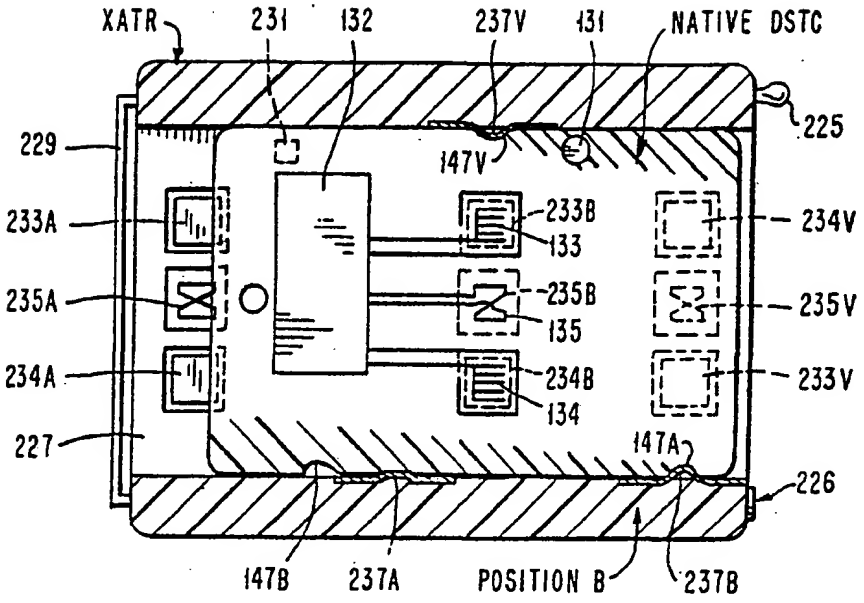
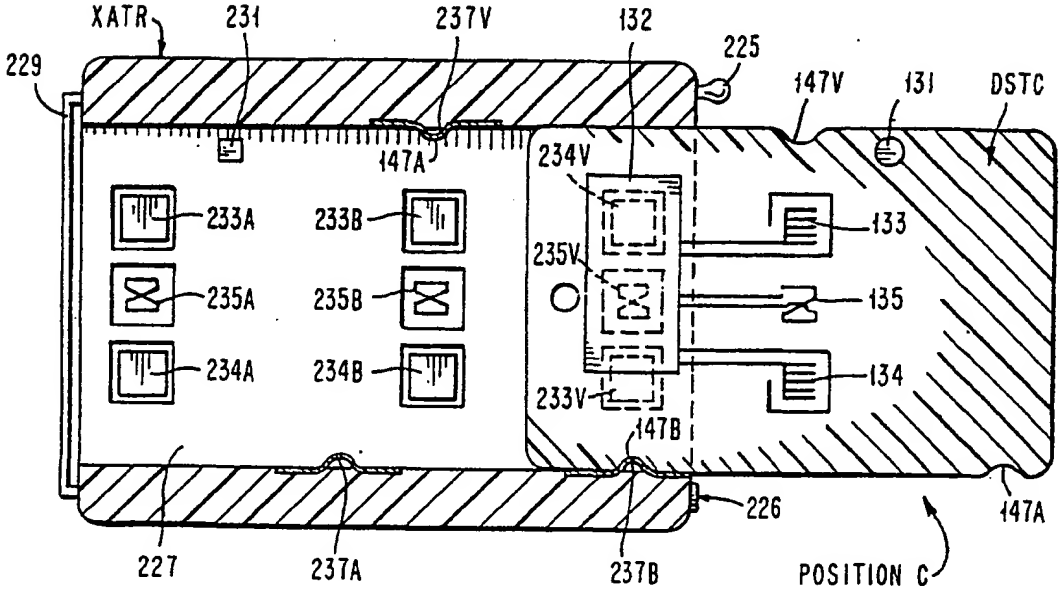

XATR
231
132
237V
131
NATIVE DSTC
225
229
147V
233A
233B
133
234V
235A
235B
135
235V
234A
234B
134
233V
227
147A
226
147B
237A
POSITION B
237B

FIG. 8


XATR
231
237V
132
225
229
147V
131
DSTC
147A
234V
233A
233B
133
235V
235A
235B
135
234A
234B
134
233V
147B
226
147A
227
237A
237B
POSITION C

SPECIFICATION

Portable terminal device, for example, for financial transactions

This invention relates to a portable terminal device which may be used, for example, for financial transactions.

Modern business practices have to a large extent made the handling of actual cash (with the inherent dangers of theft and loss) unnecessary in many sectors of our economy. These include banking, large retail stores, and a large variety of other businesses where articles are charged to an account, the individual billed, and the bill subsequently paid by cheque. In such businesses the actual amounts of money owed and to be credited are kept track of largely through the use of computers which record detailed transaction data, including amounts and the identity of the sellers and purchasers. Banks, credit granting organizations, and large retail stores frequently use computers for the purpose of maintaining customer accounts, debiting and crediting such accounts as the need arises.

However, an individual must still have fairly substantial amounts of cash for making purchases from other individuals, food stores, petrol stations, and the like. It is believed that there is a long felt need in this area to make the advantages of a "cashless society" available to individuals for small transactions. Such a system, to be practical, would of necessity have to be able to take care of both purchases and sales. Further, in order for such a system to be practical and allow people to have faith in the system, it would be helpful to provide means in such a system to maintain sufficient records of identities of both purchasers and buyers which information could be made available in written or in printed form on a regular basis. A further valuable adjunct to such a system would be to allow the use of devices with which everyone is familiar such as, for example, a credit card or credit card-like device for storing the record of the actual transfer of merchandise and credit. Such cards have been used in the past but are believed to have been largely limited to use with a standard terminal such as a point of sale terminal in a department store, cash issuing terminals, and the like.

In addition to the need for "cashless" transactions it would also be advantageous if such a system could be extended to perform the function of cheques and a current bank account. In other words, when the credit card-like device was presented to a person in payment for merchandise or services the recording of the transaction by both the seller and purchaser would automatically result in a debit notice or memorandum being placed in the purchaser's card and a notice of receipt of the 'promise to pay' placed in the seller's account. At some point in the future when the seller presents the electronically recorded account invoices to a central payee, or bank, it is at this time that the purchaser's account would actually be debited. As will be evident, such a transaction would differ from the above mentioned cash transfer operation in that the actual time of debiting of the purchaser's account would occur at some point in the future.

A further feature which could be incorporated in such a system utilizing a credit card-like device would be a normal credit card function which could be utilized at a wide variety of different stores with all charges going into a central clearing house for charging to a particular account. In addition, the normal large company type of credit account wherein the company has its own credit plan, could also be accommodated within the single credit card-like device. All of the above desired features of such a system could optimally be contained on a single credit card-like device wherein the customer would indicate the type of account and procedure which he desires to utilize as well as giving his appropriate account numbers or other identifying information.

In order for such a system to be practical, it should be noted that it would be very desirable to provide a device which would, in effect interface between the individual's credit card-like device and the various terminal devices which would be present in stores and the like such as, point of sale terminals, cash issuing terminals, which would give the individual control over the type of transaction that is ultimately entered into his card. Present business practices, including the use of credit cards in stores, take the credit card out of the individual's possession for a short time, and unauthorized access to certain of the individual's financial data could readily be obtained by such stores during this short time. By suitably designing an interface device it is possible to limit access to the credit card-like device to only a particular account or data designated by the individual. Optimally, the design would also limit access to only certain specified information regarding an account. Thus, such an interface device, if suitably designed could provide the individual with control over his card and the data therein, giving a much higher degree of financial protection to the individual both from inadvertent mistakes and deliberate misuse.

According to the invention, a portable self-contained hand-held terminal device comprises data processing means, means for accepting at least one data storage and transfer card, first input/output means for interfacing said processing means with a human operator, second input/output means for interfacing said processing means with said data storage and transfer card, and third input/output means for interfacing said processing means with another external terminal device.

The invention will now be particularly described, by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a block diagram of circuitry contained in a preferred embodiment of a terminal device constructed in accordance with the present invention,

Figures 2-1, 2-2, 2-3 and *2-4* comprise top, side, bottom, and front views respectively of such a device,

Figure 3 comprises a view of such a device showing the location of certain elements mounted on the surface thereof,

Figure 4 comprises a view, partly in cross section,

illustrating the placement of certain information transfer and power transfer components on the surface of the device,

Figure 5 shows details of a typical data and storage card (DSTC) suitable for use with the terminal device,

Figure 6 is a view, partly in cross section, of the terminal device showing two DSTCs in place therein,

Figure 7 is a view, partly in cross section, of the terminal device showing a single DSTC in place therein, and

Figure 8 is a view, partly in cross section, of the terminal device showing an individual DSTC in a second position such that different operations are possible than when the DSTC is located as illustrated in Figure 7.

A personal portable terminal device will be described which includes a keyboard for entering transaction data, and a memory for temporarily storing transaction data and other selected financial data pertaining to the transaction. Logic means are also contained in the device for performing arithmetic operations on data stored in the memory and data entered via the keyboard. A display is provided for receiving one or more data and storage cards (DSTCs) in the device and for entering transaction data from the device into the DSTCs. Further means are included within the device for selectively crediting the account balance stored in one DSTC and for debiting the account balance stored in the other DSTC.

In addition to being adapted to receive one or more DSTCs, the device is further adapted to be connected to other external devices of the same type and also larger more sophisticated devices such as point of sale terminal in a retail establishment or a data entry terminal whereby material stored on a DSTC may be entered into a central computing system via the XATR.

Before proceeding with a detailed description of the disclosed preferred embodiment some general description of the overall use and function of the device will follow together with a general description of other possible features which could be included in such a device but which are not specifically disclosed or claimed herein.

The personal portable terminal device or transactor (XATR) would normally, although not necessarily, be owned by owner or holder of an individual DSTC. In the following description it will be assumed that when the same person owns an XATR and a DSTC that this DSTC is referred to as the "native" DSTC when placed in the XATR. A DSTC which is the property of another person and which may be temporarily housed in someone else's XATR for purposes of data transfer is hereinafter referred to as "visiting" DSTC.

In addition to coupling with one or more DSTCs the XATR is configured to be plugged into or otherwise placed in a cooperative data exchange relationship with a number of other devices. Among these possibilities are the ability to be connected with another similar XATR and its associated native DSTC. It could, additionally, provide an interface between its own native DSTC and a point of sale terminal, a data collection terminal, a data entry terminal, or various types of identity authentication devices.

The XATR, its native DSTC, and all other devices disclosed herein are intended primarily to facilitate the execution of financial transactions in the absence of currency or cheques. Secondly, the XATR and its native DSTC may provide other data entry, storage retrieval, and computational or display functions whch are useful to the owner.

In general, operation of an XATR involves a transfer of information such as digital data bytes and/or control bytes between the XATR and one or more devices in communication therewith in both directions. All such information transfers are communicated through the same medium (air in the disclosed embodiment) over distances which may range from a maximum of say 0.25 inches to a minimum of several thousands of an inch. As it well known in the communications art, such communication may either be full duplex or half duplex. Either mode could be employed in the information transfers between an XATR and another device. For purposes of the present description full duplex operation is assumed.

It will, of course also be apparent that the particular mode of communication between an XATR and other devices could take on a number of other forms, the most obvious of which would be direct electrical contacts. However, it is to be noted that a system utilizing such contacts would be subject to wear and a number of other obvious disadvantages. It is accordingly assumed that capacitive air coupling would be utilized in such a system.

In full duplex transmission through a common medium, separation of the two signals which are propagating in opposite directions may be accomplished by spatial division, frequency division, or with hybrid circuits (i.e. directional couplers). Any of these modes could be employed in the information transfer between an XATR and another device. For purposes of the present description spatial division will be assumed.

In full-duplex spatially-divided transmission through a common medium, coupling may be inductive, capacitive, modulated radio frequency, or some combination thereof. Any of these coupling means could be employed in the information transfers between a XATR and another device. For the purposes of the present description, capacitive coupling of modulated radio frequency signals will be assumed.

In general, operation of a XATR involves a transfer of power from the XATR to one or two DSTCs. This power is necessary to allow the transfer of data to and from the storage circuitry resident within such a DSTC. In addition, operation of an XATR in conjunction with other devices could possibly involve the transfer of power from such other devices to the XATR. For all such power transfer operations, inductive coupling of an A.C. signal is assumed.

Referring now specifically to Figure 1, there is shown a functional block diagram of the electrical and electronic circuitry of a preferred embodiment of XATR. Bracket 210 indicates the interface to the

owner or operator of the XATR. Bracket 220 indicates the interface between an individual XATR and some other device such as, for example, another XATR, a point of sale terminal, data collection terminal, data entry terminal, or simply a charging station. Bracket 230 indicates an interface between the XATR and one or more DSTCs.

The input and output means of the XATR available to the operator or owner are a keyboard 211, a display 213 and an on/off switch 212. The display 213 would conventionally be alphanumeric in character and would be capable of indicating such items as the type of transaction, the amount of the transaction, and other information pertinent to the transaction. The following elements are located along the interface 220. A transformer winding 221 supplies charging power to a local battery 242 when such charging is required. A magnetic field sensor 222 detects the field of a magnet located in another associated device. This sensor 222 is preferably a magneto resistive device, a permanent magnet actuated reed relay, or some other device for indicatng to the XATR that the XATR is in a data and/or power transfer relationship with another device and that certain predetermined operational sequences are now possible. Capacitor plates 223D and 224D allow transmission of data from and to the XATR respectively, and would operate in combination with similarly disposed plates on the device to which the XATR is coupled. As stated previously, it is assumed that the actual data and control signals are transmited via modulated radio frequency signals between the devices.

As will be described subsequently, the native DSTC associated with a particular XATR typically interfaces to the XATR when it is in a first position, hereinafter referred to as position "B". In addition, when a visiting DSTC is associated with a particular XATR, the native DSTC is moved to a second position referred to herein as position "A". The visiting DSTC occupies a position referred to herein as position "V". Thus, three interface positions are indicated along interface 230, as positions "A", "B" and "V". It will be noted that each position comprises two communication paths (capacitor plates 233 and 234) and a power link (transformer winding 235).

Capacitor plates 233A, 233B, and 233V combine with similar capacitor plates located in the individual DSTCs to provide information transmission paths for modulated radio frequency signals from the XATR to the DSTCs. Capacitor plates 234A, 234B and 234V combine with similar capacitor plates located in the individual DSTCs to provide information transmission paths for modulated radio frequency signals from the DSTCs to the XATR.

The transformer primary windings 235A, 235B, and 235V, cooperate with similar secondary windings in the DSTCs to provide power transmission paths from the XATR to the DSTCs to provide power transmission paths from the XATR to the DSTCs to perform the necessary operations referred to previously. A magnetic field sensor 231, similar to the device 222 described previously, indicates to the XATR that its native DSTC is located in position A.

A D.C. power source 24 for operation of the XATR includes a rectifier 241 whose input is the secondary winding 221 and whose output is connected to the rechargeable battery 242. Rectifier 241 could also contain circuitry to prevent overcharging of the battery 242 and protective circuitry to prevent damage to the elements within source 240 in the event of the application of an improper excitation to the winding 221. The battery 242 is shown as having one output 243 which is connected to all circuits in the XATR which must be continously energised.

Various power control switches 244 selectively, in response to signals from power control logic 253, apply power to various circuits. Typically, output 254 may energise the display 213 and output 246 may energise all other circuitry within the XATR. Outputs 243, 245 and 246 are labelled in the disclosed circuitry as appropriate.

The digital circuits of the XATR lie within block 250. In block 250, a digital processor 251 is shown whose major functions are control, message formatting, message routing, checking, addition, subtraction, and input/output operations. Other than a read only storage required for its own control routines and the routines which it executes in the various modes of operation and the temporary data storage required for the execution of such routines, the pocessor contains no storage. Thus, in the presently disclosed embodiment, the processor contains no storage for financial transaction data. A digital clock 252 is provided which keeps time in seconds, minutes, hours, days, months and the last two digits of the year. It also contains counters for the implementation of the timing functions of the XATR.

Power control logic block 253 operates in response to signals from the on/off switch 212 and the magnetic sensors 222 and 231, to energise or di-energise the appropriate circuits. It also de-energises appropriate circuits in response to time out signals from the digital clock 252. Line 254 is a signal path which indicates processor activity and resets the time out counters in the digital clock. Line 255 is the signal path for setting the digital clock. Line 256 denotes the signal paths over which clock signals and time information are delivered to the processor and line 257 comprises the signal path over which time out signals are delivered to power control logic 253.

The analogue and hybrid circuits of the XATR lie within block 260. Within this block 261 is a rudimentary receiver which converts received modulated radio frequency input signals to digital output signals. Element 262 is a rudimentary transmitter which converts a digital input signal to a modulated radio frequency output signal. Element 264 is an analogue switch which routes radio frequency signals from a selected input to the receiver 261. Element 264 is an analogue switch which routes radio frequency signals from the transmitter 262 to a selected output. Element 265 is an oscillator connected to an A.C. power switch 266 which in turn routes A.C. power for delivery to the DSTCs via selected transformer primaries 235A, 235B, or 235V. It should be noted that the analogue switches 263, 264, and 266 are controlled by a common input 267. 233*i*, 234*i*, and 235*i* or 223*i* and 224*i* are all activated simultaneous-

ly, where *i* equals A, B, V, or D. It will be remembered from the above description that 'A', 'B', and 'V' correspond to various positions of one or two DSTCs located within the receiving slot of an XATR and that position 'D' corresponds to an XATR connected to another external device other than a DSTC as described above.

Referring now to Figure 2, the overall geometry of a typical XATR is shown. Figures 2-1, 2-2, 2-3 and 2-4 are top, side, bottom and front views respectively of the XATR specifically shown and described in block form in Figure 1. It should be noted that the same reference numerals are utilised throughout the present description and drawings to identify the same elements. Referring to Figure 2-1 the top surface of the XATR esentially corresponds to the operator interface 210 as shown in Figure 1. On the top surface are located the keyboard 211, ON/OFF switch 212, and the alphanumeric display 213.

The front surface of the XATR is depicted in Figure 2-4 and corresponds to interface 220 in Figure 1. The electrical components mounted along this surface are shown in Figure 1 and their function will be described later. However, in addition to these components, a male aligning and fastening pin 225 is shown, which, with modest force is designed to snap into or out of a complementary female aligning and fastening hole or socket similar to 226 in another XATR, point of sale terminal, data entry terminal, or the like. Conversely, plug or hole 226 is a spring loaded female aligning and fastening structure which with modest force snaps or unsnaps around a complementary male aligning and fastening structure in another XATR, point of sale terminal, data entry terminal, or the like. Thus, elements 225 and 226 are exemplary of any one of many possible complementary mechanical mating structures. They function to physically align and attach devices and, as disclosed, do not form any part of the control or data transfer function. The side view of the XATR shown in Figure 2-2 shows the configuration of the male member 225 and also of a simple retention ball 229 (also shown in Figure 2-1 and 2-3) which may be provided to allow for the physical attachment of the XATR into a wallet or some other form of relatively high security holding device. Also shown in Figure 2-2 at the bottom are two dotted lines which define a slot 227 formed by overlying tabs 228 for receiving the DSTCs.

The bottom surface of the XATR shown in Figure 2-3 corresponds to the DSTC interface 230 of Figure 1. The actual operation of the components mounted along this surface will be described in further detail later. The two overhanging tabs 228 are preferably made of metal or some other suitable material which contains a continuous conducting screen or sheet whose purpose is to prevent unauthorized evesdropping on transactions as will be understood. Also, as will be described in detail later, the DSTC may be moved to the various positions A, B, and V within the slot 227 by means of thumb or finger pressure applied through the open space between the tabs 228. In Figure 2-2 a DSTC is illustrated in position B.

Referring now to Figure 3, there is shown a front view of a XATR showing previously identified components 225 and 226 and components described in connection with above description of Figure 1. These components may be mounted flush with the surface, but, for protection and for appearance are preferably mounted a short distance below the surface under an appropriate covering material which will not interfere with data or power transfer between devices. These surface components are a multi-turn transformer secondary winding 221 which may be fitted with a partial ferromagnetic core, a magnetic senso element 222, the input and output capacitor plates 224 and 223 and a permanent magnet 222M which activates a magnetic sensor, such as 222 described above, for use when the XATR is mated with another XATR or other external device having a sensing element similar to element 222.

Figure 4 is a bottom view of an XATR along section line 4-4' of Figure 2-2 showing components described in connection with the DSTC interface 230 of Figure 1. These components may be mounted flush with the surface, but, for protection and for appearance are preferably mounted a short distance below the surface under a suitable protective material. These components are the magnetic field sensor 231, the output capacitor plates 233A, 234B, and 234V, and the transformer primary windings 235A, 235B, and 235V which may also be fitted with partial ferromagnetic cores.

According to a preferred embodiment of the invention there is a continuous electrically conductive surface 236 which covers the entire bottom surface of the XATR with the exception of regions or windows W around the components 233, 234 and 235. The surface or film 236 is a ground reference plane and also functions as a radio frequency shield for security purposes. Further, as mentioned previously, the shield located within the tabs 228 may be connected to the shield 236 to extend both ground plane and the radio frequency shielding effect. Members 237A, 237B and 237V are flat spring members having semicircular locators which extend into the DSTC slot 237 in the bottom of XATR. These semicircular positioning members engage corresponding notches in the sides of the individual DSTCs to retain and position the DSTCs in the slot in one of the three positions, A, B, or V.

Before describing the cooperative operation of an XATR and a DSTC it is necessary to briefly set forth the components and operations of a typical DSTC having a structure complementary to that of the herein disclosed XATR.

Figure 5 is a sectional view of a typical DSTC showing the components associated with the operation of the DSTC in the course of a typical financial transaction or other data retrieval/storage operation. A permanent magnet insert 131 cooperates with the sensor 231 in the XATR to indicate that there is a DSTC present in the slot 237. Element 132 depicts the electronic circuitry of the DSTC which may include a rectifier connected to secondary winding 135, a receiver connected to element 133, a transmitter connected to element 134, various digital control circuits and digital storage elements. In response to commands from an XATR, the DSTC either stores data received from the XATR or transmits data

stored within the DSTC to the XATR. Element 133 is a capacitor plate which, in combination with similar plates (i.e. 233) in an XATR, comprises an information receiving path for modulated radio frequency signals from the XATR. Element 134 is a capacitor plate which, in combination with similar capacitor plates (i.e. 234) in the XATR, comprises an information transmitting path for modulated radio frequency signals from the DSTC. Element 135 is a transformer secondary winding which, in combination with similar primary windings (i.e. 235) in an XATR, provides a power transmission path from the XATR to the DSTC. Elements 137 and 138 are conductors which are connected to ground.

Notches 147A, 147B, 147V allow the DSTC to be positioned in one of the three positions A, B or V. It will be noted that both the sides of the notches 147A and 147V are rounded while only the right side of notch 147B is rounded. The function of the notch contours will be described later.

It should be noted at this point that conventionally on such a DSTC various types of identity or authentication information could be provided so that the authenticity of the holder of a particular DSTC might be verified in some manner, such as by comparing a stored number with a key entered number with or without cryptographic complexity added to a translation and comparison routine. Alternatively some relatively simple physical descriptive material could be store in the DSTC which would be susceptible of display on an XATR. However, the details of the circuitry for performing such identifying operations are not considered a part of this invention and accordingly are not specifically disclosed herein.

There will now follow a description of various cooperative operations between an XATR and one or more DSTCs. As stated above, identity verification or user authorization routines are not considered part of this invention and accordingly only financial transaction operation will be described.

As set forth previously, the positioning of the DSTC in various location, i.e. positions A, B, or V, have been generally referred to especially with reference to Figures 4 and 5. Figure 6 shows a composite view of the XATR with both a native and visiting DSTC in positions A and V, respectively. It will be noted that although the two DSTCs are shown as abutting at one end, this is not essential.

Referring to Figure 6, it will be noted that the visiting DSTC is mechanically located and held in position by springs 237V and 237B and that its input/output interface elements 133, 134 and 135 are mechanically aligned with elements 233V, 234V, and 235V, respectively, in the XATR. It will further be noted that the native DSTC is mechanically located and held in position by spring 237A and that its input/output interface elements 133, 134 and 135 are mechanically aligned with elements 233A, 234A, and 235A, respectively, in the XATR. It will be further noted that the magnetic insert 131 on the ntive DSTC is mechanically aligned with the magnetic sensing element 231 of the XATR.

Figure 7 shows a native DSTC in position B. It will be noted that the DSTC is mechanically located and held in position by springs 237B and 237V. Its input/output interface elements 133, 134 and 135 are mechanically aligned with the elements 233B, 234B and 235B, respectively, in the XATR, the DSTC being totally housed within the XATR slot 237.

Figure 8 shows the DSTC in position C. It will be noted at this time the DSTC is mechanically located and held in position by the spring 237B and that its input/output interface elements 133, 134 and 135 are outside the transactor. In moving the DSTC from position B to position C there is a danger that the DSTC might be pushed completely out of the XATR, dropped, and possibly lost. This danger is eliminated by the cooperative action of spring 237B and the special contour of notch 147B. From a very brief description of Figures 6, 7 and 8 it is obvious that a native DSTC can be inserted in the XATR slot from either end but that it can be removed from the XATI only be moving it to the left.

Having described the physical location of both the native and visiting DSTCs in the various positions A, B, V, and C there will now follow a description of typical financial transfers between two DSTCs. Both DSTCs may function as debit cards or the operation may be the equivalent of writing a cheque. In the course of exeucting finanacial transactions, one XATR, in response to keyboard entries, always forms a transaction message. This message preferably contains the following iems:

1 The unique identifying number of the native DSTC.

2 The unique identifying number of the visiting DSTC.

3 The date (month, day, and at least two digits of the year) and the time (hour, minute, and second).

4 The direction of the transfer, i.e., whether the native DSTC is to receive a debit or a credit.

5 The amount of transaction in a specified currency.

6 An indication of whether the details of the transaction are to be "journaled" or not, i.e., whether a central reconciling and recording system shall prepare a hard copy record of the transaction for subsequent delivery to both parties to the transaction for subsequent delivery to both parties to the transaction. Such an operation *per se* is obvious to those skilled in the art and does not form a part of the present invention. The only reference to this operation is a bit or bits which indicate that "journaling" is required.

The physical description of positions A and V have been previously described. These positions are used in the execution of financial transactions between the owner of the XATR and its native DSTC and the owner of a visiting DSTC who does not own or have an operating XATR. In this mode of operation the DSTC's are positioned in the XATR as shown in Figure 6 to align the cooperative power and information transfer elements. One of the parties to the transaction, performs the following operations on the keyboard of the XATR. First the ON/OFF switch is turned to the ON position. This causes the XATR circuitry to be turned on and the appropriate power and communication paths between itself and both DSTCs. Both DSTCs are now powered. Referring to the keyboard configuration of Figure 2-1, the PAY (or

RECEIVE) key is depressed. The alphanumeric display would then read "PAY" (or "RECEIVE"). It will be noted that in the presently disclosed system the operations PAY, CHARGE, and RECEIVE are relative to the native DSTC. Next appropriate keys 1, 0, 2, and 4 are depressed in sequence to indicate that 10.24 is to be credited to the visiting DSTC and debited from the native DSTC. The display 213 should now read "PAY 10.24". At this point the JOURNAL key could be depressed, and cause a "J" to appear on the display. Now both parties to the transaction inspect the display to confirm that the transaction indicated is correct in all respects. Agreement having been reached, the operator depresses the EXECUTE key and the XATR performs the following operations.

1 Reads the date and time from its clock.

2 Reads the identifying number of its native DSTC.

3 Reads the identifying number of the visiting DSTC.

4 Reads the balance in its native DSTC.

5 Reads the balance in the visiting DSTC.

6 If a PAY operation is indicated, determines that the balance in the native DSTC is greater than the amount indicated. If a RECEIVE operation is indicated, determines if the balance in the visiting DSTC is greater than the amount indicated.

7 Forms the transaction message.

8 Computes the new balances for both DSTC's.

9 Stores in the visiting DSTC the transaction message and the new balance.

10 Stores in the native DSTC the transaction message and the new balance.

The transaction is now complete, the visiting DSTC is removed from the XATR, the native DSTC is returned to position B and the XATR is turned off.

There will now be described the operations which would occur when the native DSTC is in position B. The physical configuration of position B has been described and illustrated previously with respect to Figure 7. This position is used in the execution of transactions between two owners of XATR's each with its own native DSTC or between an owner of an XATR with its native DSTC and another device such as a point of sale terminal, bank terminal, or the like. It should be noted that functionally such other devices are identical in operation to an XATR with its native DSTC. For simplicity of description, operation involving two XATRs is described below. In this mode of operation the two XATRs are coupled tother, front-to-front, as described previously with respect to Figure 2-4 with the mating members 225 and 226 interconnected. Such coupling action causes the magnetic sensor 222 in each XATR to be activated by the corresponding magnetic insert 22M in the other XATR and thus causes both XATRs to be turned on and the necessary communication link between the XATRs to be established. Either person may initiate operation by depressing either the PAY or RECEIVE key on his own transactor and the person initiating the action, for the time being, seizes control of both XATRs and the communication link between The control XATR display now reads, "PAY" (or "RECEIVE") and the slave XATR display reads its complement.

The person with the control XATR continues with the following operations. (It is assumed that the ON/OFF switch for both XATR's was placed in the ON position prior to their interconnection). The appropriate numeric keys are depressed in sequence to indicate that 10.24 is to be transferred in the appropriate direction. The control XATR now reads "RECEIVE (or PAY) 10.24". The control XATR now relinquishes control. Typically at this point both parties to the transaction inspect their displays to confirm that the action indicated is correct and acceptable. Optionally, either party may depress his JOURNAL key. If either JOURNAL key is depressed J appears in both displays after the transaction designation. No further action occurs until both parties to the transaction depress the EXECUTE keys on their respective XATRs. When the second EXECUTE key has been depressed, the XATR containing same seizes control and the ten operations enumerated above with respect to positions A and V occur. As will be appreciated, these operations result in the complete transaction data being recorded on both DSTCs. The transaction is now complete and the XATRs are disconnected and turned off.

The operation of the XATR with its native DSTC in position C will now be briefly described. Position C was physically described with respect to Figure 8. The position is used when the owner of the XATR and its native DSTC (because of the small amount of money involved, a desire to save time and/or sufficient faith in the other party to the transaction) desires to have a PAY operation executed by the receiving party's equipment without exercising any control over or participitating in the transaction. In this mode of operation, the extended DSTC is placed in (or passed through) a slot or placed in an appropriate position on a surface which is fitted with elements which are the same as 233V, 234V and 235V in Figure 4. The receiving party's equipment performs operations which are functionally identical to those described for position V, above, for a visiting DSTC. In fact, in position C a DSTC while still partially in its XATR may be a visiting DSTC in another XATR. RECEIVE operations may also be executed with the DSTC in position C.

The above description of the operation of the presently disclosed preferred embodiment of an XATR with various combinations of DSTCs, other XATRs, and other devices completes the description of the essential features of the herein disclosed transactor. However, for the sake of completeness and for the further reason of setting forth the wide variey of possible uses which could readily be found for the XATR/DSTC combinatiions, the following brief description of a number of other possible uses is included herein.

An XATR with its native DSTC in either position B or position C or a DSTC in the absence of an XATR may, in certain combinations, interact with any of a number of other devices as referred to briefly previously. As indicated previously, a XATR with its native DSTC in position B may readily interact with a point of sale terminal in a manner essentially identical to the operation betweeen two XATRs each

with its native DSTC in position B, insofar as the information recorded in DSTC and the operation of XATR is concerned. The following differences would of course be present.

A point of sale terminal would, typically, be physically larger than an XATR and it would be powered by the local line voltage, rather than by a battery. It would also, typically be fitted with an A.C. transformer primary winding, similar to the secondary winding 221, as shown in Figure 3 to deliver battery recharging power to the XATR in the course of the transaction.

An XATR with its native DSTC in position C could also interact conveniently with certain data collection terminals. The operation would be the same as that described above for the operation in position C. This mode of operation or use would be where the financial amounts were quite small to the point where specific journaling and record keeping would hardly be justified in addition to the fact that people with whom one would be dealing would be hardly likely to be dishonest. The situations anticipated for this type of operation might be in connection with the payment of highway and bridge tolls, subway fares, street car and bus fares and possibly the payment of telephone charges, etc.

One final interaction between an XATR and its native DSTC which should be touched on is the interaction with a data entry terminal. Since the storage space in a DSTC will be limited and all transactions must, eventually, be reconciled by some central system, means for transferring the information in a DSTC to the central system is needed. Some form of data entry terminal would obviously provide this function.

Although no specific data entry terminal is anticipated, it is possible that it would be some form of a communication device, typically a telephone, which is fitted with elements which are complementary to the XATR elements shown in Figure 3. When the XATR with its native DSTC is connected to the data entry terminal, the data entry terminal reads the transaction messages and transfers them to the central system, assuming of course that a prior communication channel has been set up and a "ready to receive" signal of some sort has been received, at which point a "begin data entry" button of some similar button is pressed which causes the complete contents of the storage area of the DSTC to be read into said central system. The storage area of the DSTC is then erased and/or appropriately updated to prepare it for future use. During this operation the data entry terminal could also be equipped to provide battery recharging power to the XATR as described above.

An alternate form of data entry terminal could obviously have a slot for a DSTC alone so that the operation described above may be performed in the absence of an XATR. However, such a configuration would not have the advantage of protection, control, and privacy of the DSTC afforded by the transaction as described previously.

As briefly alluded to previously, the DSTC device might readily be provided with some sort of identity verifying codes, numbers, etc., which could be utilized in a number of different ways for verifying the identity of the card holder. However, it is not believed that such identity verification forms a part of this invention and accordingly such details are not included.

From the above description of the presently disclosed and described Personal Portable Terminal or Transactor, it may readily be appreciated that a wide variety of functions may be built into such an overall system depending upon just how much circuitry and program storage is provided in the XATR and, similarly, how much storage capacity, etc., is included in the DSTC. Thus, as stated previously, a single DSTC could be provided with cash accounts, the equivalent of chequeing accounts, a wide application charge account, and a number of individual large store accounts. All of these would be identified by special account numbers and would automatically give access to certain data in the DSTC relating to these accounts. By utilizing the terminal device as an interface between the individual's DSTC and the point of sale terminal etc., the individual will know at all times the details of every operation going on within his DSTC including the particular account number being accessed, as well as the transaction amount and the nature of the transaction. Further, by the provision of an appropriate entry key, entry of an incorrect transaction may be prevented as well as access to unauthorised accounts. Thus, the individual has a high degree of control over just what goes on relative to his accounts. Such control is not generally available in most present systems. This control obviously provides the individual with protection against both accidental and intentional transaction errors being recorded in a particular account and also prevents unauthorised access by, for example, another person, a store, or a bank, into account data which the individual may not wish to be revealed. As will further be apparent, other more sophisticated control functions could be built into the XATR and the DSTC utilizing the basic concepts disclosed and described herein.

CLAIMS

1. A portable self-contained hand-held terminal device comprising data processing means, means for accepting at least one data storage and transfer card, first input/output means for interfacing said processing means with a human operator, second input/output means for interfacing said processing means with said data storage and transfer card, and their input/output means for interfacing said processing means with another external terminal device.

2. A terminal device as claimed in claim 1, wherein said second and third input/output means each comprises data receiving and transmitting means utilizing air coupling located adjacent the physical interfaces between said device and said data storage and transfer card and external terminal device respectively.

3. A terminal device as claimed in claim 2, wherein said data receiving and transmitting means include capacitive pickup means mounted in the

surface of said device and adapted to receive and transmit respectively modulated radio frequency signals.

4. A terminal device as claimed in any preceding claim, wherein said second and third interface means include means for air coupling alternating current power between said terminal device and said other external device and said data storage and transfer card.

5. A terminal device as claimed in any preceding claim, wherein said first input/output means for interfacing with the human operator includes a keyboard for entering data into said device.

6. A terminal device as claimed in any preceding claim, wherein said first input/output means for interfacing with said human operator includes an alphanumeric display.

7. A terminal device as claimed in any preceding claim, wherein said processing means located within said device includes control means to limit operations which may be performed within an associated data storage and transfer card located within said device to those operations specified by said control means.

8. A terminal device as claimed in any preceding claim, wherein said device includes a plurality of positions for receiving a data storage and transfer card whereby two such cards may be concurrently housed within said device in data exchange relationship therewith, said device further including means incorporated in said processing means for receiving data from and storing data in both of said two data storage and transfer cards.

9. A terminal device as claimed in claim 8, wherein said device includes individual data receiving and transmitting means for simultaneously coupling with data receiving and transmitting means in each of said two data storage and transfer cards, and means for positioning said two cards in said device to effect air coupling between said receiving and transmitting means in said device and the receiving and transmitting means respectively in each of said two data storage and transfer cards.

10. A terminal device as claimed in any preceding claim, including mechanical positioning means associated with said external terminal interface means for aligning the data receiving and transmitting means in said terminal device for air coupling with cooperating receiving and transmitting means located in said external terminal device.

11. A terminal device as claimed in any preceding claim, wherein said data processing means includes memory means for temporarily storing transaction data and other selected data and logic means for performing arithmetic operations on data stored in said memory means and data entered via said input/output means.

12. A terminal device as claimed in any preceding claim, including radio frequency shielding means in said device substantially surrounding said data storage and transfer card when located therein.

13. A terminal device as claimed in any preceding claim, including battery means located in said device for providing power to operate the circuitry therein and means for converting alternating current power air coupled into said device for periodically charging said battery.

14. A portable self-contained hand-held terminal device, substantially as herein described with reference to the accompanying drawings.

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